

# Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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Vol. 5

September, 1903

No. 57

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## THE DENTARIAS OF CONNECTICUT.

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IN a tract of rocky hillside woodland in Sherman, Connecticut, within half a mile of the New York state-line, there is a large colony of the daintily beautiful *Claytonia Caroliniana* Michx., which Mr. E. H. Austin had enthused me to visit April 19, 1903, at a time when it was flowering abundantly.

With this and other interesting species were a few plants of *Dentaria diphylla* Michx., with swelling flower-buds, together with others in the same condition but strikingly different in appearance. Various situated in the damp humus of these cool woods, on rocks and in deeper accumulations of soil along the hillside, extending down a more open northerly-facing slope, nearly to the rapid waters of the Housatonic River, this peculiar plant was found in quantity at altitudes varying from 405 to 445 feet.

The stem-leaves were opposite as in *D. diphylla*, but their leaflets at once arrested my attention: distinctly narrower, more pointed and incisely-toothed, in marked contrast with the accompanying much broader and still more deeply and irregularly incised or somewhat lobate basal leaflets, they were distinctive at a glance.

When the superficial rootstocks, at times directly upon the surface and green or purple in varying degree, were uncovered, they were found to be composed of four or five to eleven or more interrupted, distinctly fusiform, toothed and tuberculate segments of annual growth and wholly unlike those of its companion species.

In flowering specimens kindly gathered for me by Mr. Austin, on May 3, and in others which we both collected one week later, the distinctions noted were strengthened by an additional one of equal interest:



the white flowers were remarkable for their large size, exceeding those of any other of our species, especially its companion of these woods, the extremes of each barely connecting.

*D. diphylla* is our only species to which the term "rootstock continuous" has been applied, in apposition to "jointed" as noted for all the other species. Studies in both field and herbarium seem to show that the latter term has been loosely applied. Each annual segment of most so-called "jointed" rootstocks may be a joint, but in those of the plants observed in Sherman and in all others known from our region, with one exception, there is not the faintest indication macroscopically or by fracture of a fixed or definite place of the union between these enlarged parts of the rootstock.

Just prior to the close of a field meeting of the Connecticut Botanical Society, held at Rainbow, on the Farmington River, June 6, 1903, I was particularly fortunate in finding a colony of *D. maxima*. In rich soil along the banks and alluvial bottoms of a woodland stream and nearly concealed by luxuriant later vegetation, were quantities of this rare and little understood species, chiefly noticeable for the array of bright yellow foliage like spots of sunshine filtered through the leaves overhead.

Careful search was instituted for the best the colony afforded, in company with Mr. B. B. Bristol. Although occasional plants bore pods of about mature size, few of these seemed destined to mature seeds owing to the aestival decadence prevailing among their kind. This colony seems to occupy a narrow area approximating a length of ten or twelve rods.

In this species the rootstock has been specially noted as "jointed." These plants seem to be fairly representative of the species, but there are no joints in any proper sense of the term. In fact, the rootstock is made up of constricted fusiform portions in a manner similar to the Sherman plants, but tubercled in the axils of *prominent* incurved teeth. A noteworthy and distinctive character seems to be the lifelong persistence, near the base of each segment, of the pre-morse remains of former stems and leafstalks and more conspicuous than any other appendages.

Since this appeared to be the second <sup>1</sup> Connecticut station for this species and, as it happens, in the same county of Hartford, studies were made to include specimens from the recorded station. These

<sup>1</sup> See RHOD. V, 168-169.



were found to have rootstocks somewhat anomalous in character and in other respects differed from any species now recognized, as will be described. This leaves the station for *D. maxima* noted in the present article the only one so far known in the state.

The plants reported by Mr. Bissell and *D. heterophylla* do not have jointed rootstocks although in the latter the fragile constricted connecting parts promotes easy rupture. *D. laciniata*, on the other hand, does have truly jointed and characteristic rootstocks in which fracture must and does occur at the precise place in which the apex of one portion is seated within a corresponding depression in the one beyond.

Inasmuch as our northeastern species are, in part, still imperfectly known and revision of these seems desirable, an attempt is made to outline the more important characters in the following summary, in which I have had the valued advice and coöperation of Dr. B. L. Robinson.

#### SYNOPSIS OF SPECIES.

\* Rootstock continuous, prominently toothed: stem glabrous: leaflets dentate, bluntly mucronate.

*D. DIPHYLLA* Michx. Rootstock long and continuous, prominently toothed, the annual segments elongated, 3 to 9 cm. long, very slightly tapering; on or near the surface and propagating by its branches. Stems 2 to 4 dm. high, glabrous, stout, simple rarely with an additional flowering branch bearing a single ternate leaf. Leaves ternate, glabrous, those of the stem 2, opposite or nearly so, rarely 3 and alternate, on petioles 1.2 to 3.6 cm. long; basal usually present, long-petioled and similar. Leaflets 2 to 10 cm. long, 1.5 to 6 cm. wide, sessile or short-petiolate, minutely serrulate, unequally and coarsely subacute- to round-dentate, bluntly mucronate; central ones rhomboid-subovate, lateral obliquely so, often slightly lobed. Flowers white; petals 10 to 15 mm. long, twice as long as the sepals. Pedicels 1 to 3 cm. long. Pods rarely matured, 2.5 cm. long or more including style 6 to 8 mm. long. — In rich damp moist or springy soils containing much humus, in woods and shaded situations. Apparently throughout the state except near the coast in the southeastern part. Usually in colonies and local, but rather frequent in the northwestern third of the state.

\* \* Rootstock interrupted by distinct constrictions, distinctly toothed: stem glabrous: leaflets incisely-dentate, -cleft or -lobate, sharply mucronate. (Exceptions in last species).



**D. incisa** n. sp. Rootstock interrupted by the union of 4 to 11 or more distinctly fusiform annual segments 1 to 3.5 rarely 6 cm. long, slightly tubercled in the axils of distinct teeth, commonly on or near the surface and propagating by late-appearing branches; remains of earlier stems and leaf-stalks occasional, from obscure to 5 mm. long. Stems 2 to 4 dm. high, glabrous, simple stout. Leaves ternate, glabrous, those of the stem 2, opposite or nearly so, rarely 3 and alternate, on petioles 1 to 4 cm. long; basal usually present, on petioles 1.2 to 2 dm. long. Leaflets sessile or slightly united at the base, rather sparingly and minutely serrulate to ciliolate-serrulate, unequally, coarsely, and more or less deeply incised-dentate, the teeth from subacute to rounded and acutely mucronate: of the stem-leaves 4 to 9 cm. long, 1 to 3.5 cm. wide, narrowly lanceolate to lanceolate, the central one a little longer than the strongly inequalateral and commonly more deeply incised lateral ones: those of the base and detached rootstocks commonly 1.5 to 2 times wider than accompanying stem-leaflets, 5 to 10 cm. long, 1.5 to 6 cm. wide, more deeply incised or lobate, short-petiolate. Flowers averaging 9 (5-13), white, drying nearly so or more or less purple-tinted; petals 15 to 20 mm. long, 5 to 8 mm. wide, obovate, rounded at the apex, fully 2.5 times length of sepals. Pedicels 1 to 3 cm. long. Style soon 6 to 8 mm. long. Pods not seen. — Sherman, on a rich damp slightly open to thickly wooded hillside, 2-15 m. above the Housatonic River, 125-128 m. alt., 19 April, 1903, *Austin & Eames*, no. 3820; 3 May, 1903, *Austin*, no. 3820 a; 10 May, 1903, *Austin & Eames*, no. 3820 b; 16 June, 1903, *Austin*, no. 3820 c. (Type material in the author's herbarium, also in herb. Gray.)

This species differs particularly from *D. diphylla* in the rootstock, the incised and sharply mucronate teeth of the leaflets which are distinctly narrower on the stem, and in the large petals: from *D. maxima* in its usual freedom from the premorse remains of former stems and leaf-stalks fairly characteristic of that species, its opposite leaves which are markedly different in situation, size, shape and marginal characters, sessile leaflets, length of pedicels and of the petals actually and comparatively with the sepals.

**D. MAXIMA** Nutt. Rootstock interrupted by the union of 4 to 10 or more distinctly fusiform annual segments 1.2 to 3.5 rarely 5 cm. long, tubercled in the axils of prominent incurved teeth; commonly on or near the surface and propagating by late appearing branches; remains of earlier stems and leaf-stalks generally present, premorse, prominent, persistent and distinctive, 2 to 6 mm. long. Stems 2 to 3.5 dm. (2 ft. *Nutt.*) high, glabrous and commonly stout. Leaves ternate, glabrous, those of the stem 2 or more commonly 3 (2 to 7 *Nutt.*), alternate, often remote, rarely 2 and subopposite, much smaller than in the preceding, on petioles 1 to 8 cm. long; those from the base, when present, and detached rootstocks on petioles 1 to 2 dm. long. Leaflets prominently petiolate, moderately to freely



ciliolate, irregularly incised-dentate, the teeth subacute to rounded and acutely mucronate: of the stem-leaves ovate and obtuse, 2 to 5 rarely 7 cm. long, 1.2 to 4 cm. wide, the central one rarely somewhat lobed, the oblique lateral ones frequently 1-cleft or -lobed on the outer side: those from the base and detached rootstocks sometimes similar, usually larger, much broader, 3 to 5.4 cm. long, 2.8 to 5.8 cm. wide, central one broadly rhombic-ovate, -orbicular or broader than long, 1-cleft to -parted bilaterally, lateral ones 1-parted to -divided on the outer side, the inner division sometimes 1- to 2-cleft, obliquely rhomboidal. Flowers purple-tinted, drying pale purple; petals 12 to 15 mm. long, about twice length of sepals which are ovate-oblong, obtuse, 5 to 7 mm. long. Pedicels .6 to 1.5 cm. long in flower, 1.5 to 2 cm. long in fruit. Pods rarely matured, 2.5 to 3 cm. long including style 6 to 8 mm. long.—Windsor, in rich soil on banks and alluvial bottoms beside a woodland stream flowing into Farmington River, 6 June, 1903, *Eames*, no. 3970.

Apparent hybrids between *D. diphylla* and *D. laciniata* are in herbaria as *D. maxima*, and often require careful study to be rightly understood, as they bear more or less resemblance to this species, and possess no constant characters.

***D. anomala***, n. sp. Rootstock interrupted by the union of several prominently fusiform annual segments, slightly to moderately tuberculate-bracteate on a somewhat smooth surface: deep-seated: apparently intermediate between this section and the following. Stems 2 to 3.5 dm. high, somewhat pubescent, rather slender, solitary or two together, simple or occasionally with an axillary flowering branch. Leaves ternate, pubescent on both surfaces: those of the stem 2, subopposite or separated 1 to 2 cm., or 3 and irregularly alternate a fourth on the branch when present, leafless in one instance, on petioles 1 to 5.5 cm. long: basal rarely present, similar. Stem-leaflets 2 to 5.5 cm. long, 1 to 3 cm. wide, distinctly short-petiolate, somewhat ciliolate, irregularly subacute- to obtuse-dentate or incised, acutely mucronate; central one more or less deeply cleft to 1-parted on each side, the lateral ones 1-parted to -divided on the outer side. Flowers "nearly white, just tinged with rose or purple:"<sup>1</sup> petals 10 to 12 mm. long, obovate, rounded at the apex, 3 times length of the ovate-oblong obtuse sepals which are 3 to 4 mm. long and distinctly smaller than in any other of our species. Pedicels 7 to 20 mm. long, slender in flower. Pods not seen.—Plainville, rich moist woods, 5 May, 1902, *C. H. Bissell*; 11 May, 1902, *C. H. Bissell*. (Type material in herb. Bissell, also in herb. Gray and in the author's herbarium.)

Growing with *D. diphylla* and *D. laciniata* and flowering about midway between them in time. This species may have had a hybrid origin between the widely different accompanying species, but it is

<sup>1</sup> Bissell, RHOD. V, 169.



well established in two small colonies, is very constant in all its characters and apparently well worthy of specific rank, at least tentatively. It differs particularly from any of the preceding in the pubescent stem and leaves, deeply cleft to divided stem-leaflets, the actual and comparative length of sepals and petals and in the surface characters of the rootstock: from either of the following in the situation of the leaves, size, shape and lobation of the leaflets and in the sepals and petals, together with the anomalous rootstock.

\* \* \* Rootstock interrupted by fragile constrictions, tuberous, obscurely bracteate: stems glabrous to pubescent: leaflets variable.

*D. HETEROPHYLLA* Nutt. Rootstocks interrupted by fragile constrictions connecting the few narrowly fusiform annual segments 1.4 to 3 cm. long, bearing few small bracteate tubercles on a smooth surface: premorse remains of former stems sometimes 2 to 3 mm. long: often deep-seated. Stems 1.5 to 3.5 dm. high, glabrous or somewhat pubescent, commonly slender and several together with 1 to several basal leaves, sometimes with one or two slender few-flowered axillary or erratic branches bearing a simple or cleft leaflet 1.5 to 2 cm. long. Leaves ternate, those of the stem generally 2 (2 to 3), variably opposite, subopposite, alternate or verticillate, commonly near top of stem at flowering time on petioles 0.4 to 3 cm. long: basal on petioles 2 to 15 cm. long, very different. Leaflets minutely serrulate: those of the stem 1.3 to 3.5 cm. long, linear to narrowly lanceolate, sparsely and obscurely to sharply mucronate-serrate, sometimes laciniatedentate or multifid; acute or acuminate at the apex, sessile to distinctly petiolate at the tapering base: those of the base 1.2 to 4.5 cm. long, nearly the same width, prominently petiolate, and although sometimes similar to those of the stem, usually obtuse at base and apex, broadly rhombic-ovate, the central leaflet equally, the lateral oblique and unequally trilobate by varying clefts, the teeth and apices rounded and mucronate. Flowers light purple, closely cymose-paniculate at first; petals 10 to 16 mm. long, narrow, rounded at the apex, twice as long as the oblong-lanceolate obtuse sepals. Pedicels 0.3 to 2 rarely 3.5 cm. long. Pods 2.5 cm. long.—Not known from Connecticut.

*D. LACINIATA* Muhl. Rootstocks jointed at the constricted ends of the few narrowly fusiform to oblong, often thick tuberous annual segments 2 to 5 cm. long, 4 to 12 mm. thick at maturity, and bearing on the smooth surface few small bracteate tubercles from some of which branches arise late in the season: segments uniformly separable at certain fixed places. Stems 1 to 3.5 dm. high, pubescent, at least above, rarely glabrous, stout, solitary or several together, with or generally without accompanying root-leaves. Leaves primarily ternate, often appearing quinate, those of the stem 3, commonly near top of stem, verticillate or nearly so, on petioles 2 to 5 cm. long: basal usu-



ally common in the colonies, similar, on longer petioles, 2.5 to 12 cm. wide. Leaflets glabrous to pubescent, sparingly ciliolate, simple and linear or narrowly lanceolate to ovate, and 1- to 3-lobed, -divided, or somewhat multifid, sparingly appressed-serrate to laciniate or gash-toothed, mucronate: those of the stem scarcely petiolate, of the base distinctly so. Flowers white or purple-tinted: petals 10 to 16 rarely 18 mm. long. Pedicels in flower 0.3 to 2.5 cm. long, in fruit 1 to 2 and sometimes 3.5 cm. long. Pods common, strongly ascending on stout pedicels, 2 to 4.5 cm. long including style 6 to 9 mm. long.

In rich damp or often springy soils containing much humus, in woods or along their borders. Apparently rather rare eastward (Killingly and Old Lyme, *C. H. Bissell*), it is found at infrequent intervals throughout a large part of central and western Connecticut away from the coast, sometimes in large colonies, as in Plainville, *C. H. Bissell*, and in Gaylordsville, *Austin & Eames*. Our earliest species to flower.

BRIDGEPORT, CONNECTICUT.

### ISAAC HOLDEN.

F. S. COLLINS.

ISAAC HOLDEN, son of Samuel and Sally (Brewster) Holden, was born in Preston, Connecticut, June 11, 1832. He entered Dartmouth College as sophomore in the spring of 1850, and was graduated in 1852. For twenty years after his graduation he was engaged in teaching in various places, the longest time being the last, at Clifton, Staten Island, New York, where he made a specialty of preparing young men for college and scientific schools. In 1872 he gave up teaching, and became connected with the Wheeler and Wilson Company, removing in 1878 to Bridgeport, Connecticut, where the rest of his life was spent, the last ten years as vice-president of the company, and practically in charge of its business. His death in New York City, June 25, 1903, was the result of an operation, rendered necessary by a severe attack of gall stone just on the eve of a proposed trip to Europe, June 10. He is survived by a wife, two sons and three daughters.

Mr. Holden was a man of strong character, great intellectual ability, absolute integrity, and broad sympathies. He was thoroughly at home in both ancient and modern literature, and corresponded regu-